



<110> Uefuji, Hirotaka
 Sano, Hiroshi
 Koizumi, Nozumu
 Shinmyo, Atsuhiko
 <120> Composite Utilization of a group of genes in biosynthetic Pathway
 of Caffeine
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 <302> 7-Methylxanthine Methyltransferase of Coffee Plants, Gene
 Isolation and Enzymatic Properties
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Val Gly Gln Glu Glu Lys Asn Glu Leu Glu Arg Pro Thr Ile Gln Ile	
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uuu cug aaU gau cuu uuc caa aaU gau uuc aaU ucg guu uuc aag uug	336
Phe Leu Asn Asp Leu Phe Gln Asn Asp Phe Asn Ser Val Phe Lys Leu	
100 105 110	
cug cca agc uuc uac cgc aaa cuc gag aaa gaa aaU gga cgc aag aua	384
Leu Pro Ser Phe Tyr Arg Lys Leu Glu Lys Glu Asn Gly Arg Lys Ile	
9	

115			120			125												
gga Gly	ucg Ser 130	ugc Cys	cua Leu	aua Ile	agc Ser	gca Ala 135	aug Met	ccu Pro	ggc Gly	ucu Ser	uuc Phe 140	uac Tyr	ggc Gly	aga Arg	cuc Leu			432
uuc Phe 145	ccc Pro	gag Glu	gag Glu	ucc Ser	aug Met 150	cau His	uuu Phe	uug Leu	cac His	ucu Ser 155	ugu Cys	uac Tyr	agu Ser	guu Val	cau His 160			480
ugg Trp	uua Leu	ucu Ser	cag Gln	guu Val 165	ccc Pro	agc Ser	ggg Gly	uug Leu	gug Val 170	auu Ile	gaa Glu	uug Leu	ggg Gly	auu Ile 175	ggg Gly			528
gca Ala	aac Asn	aaa Lys	ggg Gly 180	agu Ser	auu Ile	uac Tyr	ucu Ser	ucc Ser 185	aaa Lys	gca Ala	agu Ser	cgu Arg	ccg Pro 190	ccc Pro	guc Val			576
cag Gln	aag Lys	gca Ala 195	uau Tyr	uug Leu	gau Asp	caa Gln	uuu Phe 200	acg Thr	aaa Lys	gau Asp	uuu Phe	acc Thr 205	aca Thr	uuu Phe	cua Leu			624
agg Arg	auu Ile 210	cau His	ucg Ser	aaa Lys	gag Glu	uug Leu 215	uuu Phe	uca Ser	cgu Arg	ggc Gly	cga Arg 220	aug Met	cuc Leu	cuu Leu	acu Thr			672
ugc Cys 225	auu Ile	ugu Cys	aaa Lys	gua Val	gau Asp 230	gaa Glu	uac Tyr	gac Asp	gaa Glu	ccg Pro 235	aau Asn	ccc Pro	cua Leu	gac Asp	uua Leu 240			720
cuu Leu	gac Asp	aug Met	gca Ala	aua Ile 245	aac Asn	gac Asp	uug Leu	auu Ile	guu Val 250	gag Glu	gga Gly	cau His	cug Leu	gag Glu 255	gaa Glu			768
gaa Glu	aaa Lys	uug Leu	gcu Ala 260	agu Ser	uuc Phe	aau Asn	cuu Leu	cca Pro 265	uuc Phe	uuu Phe	aca Thr	ccu Pro	uca Ser 270	gca Ala	gaa Glu			816
gaa Glu	gua Val	aag Lys 275	ugc Cys	aua Ile	guu Val	gag Glu	gag Glu	gaa Glu	ggg Gly	ucu Ser	uuu Phe	gaa Glu 285	auu Ile	uua Leu	uac Tyr			864
cug Leu	gag Glu 290	acu Thr	uuu Phe	aag Lys	gcc Ala	cau His 295	uau Tyr	gau Asp	gcu Ala	ggc Gly	uuc Phe 300	ucu Ser	auu Ile	gau Asp	gau Asp			912
gau Asp 305	uac Tyr	cca Pro	gua Val	aga Arg	ucc Ser 310	cau His	uuc Phe	caa Gln	gua Val	uac Tyr 315	ggc Gly	gau Asp	gaa Glu	cau His	auu Ile 320			960
aaa Lys	gca Ala	gag Glu	uau Tyr	gug Val 325	gca Ala	uca Ser	uua Leu	auu Ile	aga Arg 330	uca Ser	guu Val	uac Tyr	gaa Glu	ccc Pro 335	auc Ile			1008
cuc Leu	gca Ala	agu Ser	cau His 340	uuu Phe	gga Gly	gaa Glu	gcu Ala	auu Ile 345	aug Met	ccu Pro	gac Asp	uua Leu	uuc Phe 350	cac His	agg Arg			1056
cuu Leu	gcg Ala	aag Lys 355	cau His	gca Ala	gca Ala	aag Lys	guu Val 360	cuc Leu	cac His	uug Leu	ggc Gly	aaa Lys 365	ggc Gly	ugc Cys	uau Tyr			1104
aau Asn	aau Asn 370	cuu Leu	auc Ile	auu Ile	ucu Ser	cuc Leu 375	gcc Ala	aaa Lys	aag Lys	cca Pro	gag Glu 380	aag Lys	uca Ser	gac Asp	gug Val			1152
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 Asn Ile Asn Lys Cys Ile Lys Val Ala Asp Leu Gly Cys Ala Ser Gly
 50 55 60
 Pro Asn Thr Leu Leu Thr Val Arg Asp Ile Val Gln Ser Ile Asp Lys
 65 70 75 80
 Val Gly Gln Glu Lys Lys Asn Glu Leu Glu Arg Pro Thr Ile Gln Ile
 85 90 95
 Phe Leu Asn Asp Leu Phe Gln Asn Asp Phe Asn Ser Val Phe Lys Ser
 100 105 110
 Leu Pro Ser Phe Tyr Arg Lys Leu Glu Lys Glu Asn Gly Arg Lys Ile
 115 120 125
 Gly Ser Cys Leu Ile Gly Ala Met Pro Gly Ser Phe Tyr Gly Arg Leu
 130 135 140
 Phe Pro Glu Glu Ser Met His Phe Leu His Ser Cys Tyr Cys Leu His
 145 150 155 160
 Trp Leu Ser Gln Val Pro Ser Gly Leu Val Thr Glu Leu Gly Ile Ser
 165 170 175
 Ala Asn Lys Gly Cys Ile Tyr Ser Ser Lys Ala Ser Arg Pro Pro Ile
 180 185 190
 Gln Lys Ala Tyr Leu Asp Gln Phe Thr Lys Asp Phe Thr Thr Phe Leu
 195 200 205
 Arg Ile His Ser Glu Glu Leu Ile Ser Arg Gly Arg Met Leu Leu Thr
 210 215 220
 Trp Ile Cys Lys Glu Asp Glu Phe Glu Asn Pro Asn Ser Ile Asp Leu
 225 230 235 240
 Leu Glu Met Ser Ile Asn Asp Leu Val Ile Glu Gly His Leu Glu Glu
 245 250 255

Glu Lys Leu Asp Ser Phe Asn Val Pro Ile Tyr Ala Pro Ser Thr Glu
260 265 270

Glu Val Lys Cys Ile Val Glu Glu Glu Gly Ser Phe Glu Ile Leu Tyr
275 280 285

Leu Glu Thr Phe Lys Val Pro Tyr Asp Ala Gly Phe Ser Ile Asp Asp
290 295 300

Asp Tyr Gln Gly Arg Ser His Ser Pro Val Ser Cys Asp Glu His Ala
305 310 315 320

Arg Ala Ala His Val Ala Ser Val Val Arg Ser Ile Phe Glu Pro Ile
325 330 335

Val Ala Ser His Phe Gly Glu Ala Ile Met Pro Asp Leu Ser His Arg
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Ile Ala Lys Asn Ala Ala Lys Val Leu Arg Ser Gly Lys Gly Phe Tyr
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Ser Tyr Ala Lys Asn Ser Phe Tyr Asn Leu Phe Leu Ile Arg Val Lys	
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cct atc ctt gaa caa tgc ata caa gaa ttg ttg cgg gcc aac ttg ccc	144
Pro Ile Leu Glu Gln Cys Ile Gln Glu Leu Leu Arg Ala Asn Leu Pro	
35 40 45	
aac atc aac aag tgc att aaa gtt gcg gat ttg gga tgc gct tct gga	192
Asn Ile Asn Lys Cys Ile Lys Val Ala Asp Leu Gly Cys Ala Ser Gly	
50 55 60	
cca aac aca ctt tta aca gtt cgg gac att gta caa agt att gac aaa	240
Pro Asn Thr Leu Leu Thr Val Arg Asp Ile Val Gln Ser Ile Asp Lys	
65 70 75 80	
gtt ggc cag gaa aag aag aat gaa tta gaa cgt ccc acc att cag att	288
Val Gly Gln Glu Lys Lys Asn Glu Leu Glu Arg Pro Thr Ile Gln Ile	
85 90 95	

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ctg	cca	agc	ttc	tac	cgc	aaa	ctt	gag	aaa	gaa	aat	gga	cgc	aaa	ata	384
Leu	Pro	Ser 115	Phe	Tyr	Arg	Lys	Leu 120	Glu	Lys	Glu	Asn	Gly 125	Arg	Lys	Ile	
gga	tca	tgc	ctg	ata	ggc	gca	atg	cct	ggc	tct	ttc	tac	ggc	aga	ctc	432
Gly	Ser 130	Cys	Leu	Ile	Gly	Ala 135	Met	Pro	Gly	Ser	Phe 140	Tyr	Gly	Arg	Leu	
ttc	ccc	gag	gag	tcc	atg	cat	ttt	tta	cac	tct	tgt	tac	tgt	ttg	cat	480
Phe 145	Pro	Glu	Glu	Ser	Met 150	His	Phe	Leu	His	Ser 155	Cys	Tyr	Cys	Leu	His 160	
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Trp	Leu	Ser	Gln	Val 165	Pro	Ser	Gly	Leu	Val 170	Thr	Glu	Leu	Gly	Ile 175	Ser	
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Ala	Asn	Lys	Gly 180	Cys	Ile	Tyr	Ser	Ser 185	Lys	Ala	Ser	Arg	Pro 190	Pro	Ile	
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Gln	Lys	Ala 195	Tyr	Leu	Asp	Gln	Phe 200	Thr	Lys	Asp	Phe	Thr 205	Thr	Phe	Leu	
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Arg	Ile 210	His	Ser	Glu	Glu	Leu 215	Ile	Ser	Arg	Gly	Arg 220	Met	Leu	Leu	Thr	
tgg	att	tgc	aaa	gaa	gat	gaa	ttc	gag	aac	ccg	aat	tcc	ata	gac	tta	720
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Glu	Val	Lys 275	Cys	Ile	Val	Glu	Glu 280	Glu	Gly	Ser	Phe	Glu 285	Ile	Leu	Tyr	
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Arg	Ala	Ala	His	Val 325	Ala	Ser	Val	Val	Arg 330	Ser	Ile	Phe	Glu	Pro 335	Ile	
gtc	gca	agt	cat	ttt	gga	gaa	gct	atc	atg	cct	gac	tta	tcc	cac	agg	1056
Val	Ala	Ser	His 340	Phe	Gly	Glu	Ala	Ile 345	Met	Pro	Asp	Leu	Ser 350	His	Arg	
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Ile	Ala	Lys 355	Asn	Ala	Ala	Lys	Val 360	Leu	Arg	Ser	Gly	Lys 365	Gly	Phe	Tyr	
gat	agt	ctt	atc	att	tct	ctc	gcc	aaa	aag	cca	gag	aag	tca	gac	gtg	1152

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 Ser Tyr Ala Lys Asn Ser Phe Tyr Asn Leu Phe Leu Ile Arg Val Lys
 20 25 30
 ccu auc cuu gaa caa ugc aua caa gaa uuU uuU cgg gcc aac uuU ccc 144
 Pro Ile Leu Glu Gln Cys Ile Gln Glu Leu Leu Arg Ala Asn Leu Pro
 35 40 45
 aac auc aac aag ugc auu aaa guu gcg gau uuU gga ugc gcu ucu gga 192
 Asn Ile Asn Lys Cys Ile Lys Val Ala Asp Leu Gly Cys Ala Ser Gly
 50 55 60
 cca aac aca cuu uua aca guu cgg gac auu gua caa agu auu gac aaa 240
 Pro Asn Thr Leu Leu Thr Val Arg Asp Ile Val Gln Ser Ile Asp Lys
 65 70 75 80
 guu ggc cag gaa aag aag aaU gaa uuU gaa cgu ccc acc auu cag auu 288
 Val Gly Gln Glu Lys Lys Asn Glu Leu Glu Arg Pro Thr Ile Gln Ile
 85 90 95
 uuU cug aaU gau cuu uuc caa aaU gau uuU aaU ucg guu uuc aag ucg 336
 Phe Leu Asn Asp Leu Phe Gln Asn Asp Phe Asn Ser Val Phe Lys Ser
 100 105 110
 cug cca agc uuU uac cgc aaa cuu gag aaa gaa aaU gga cgc aaa auu 384
 Leu Pro Ser Phe Tyr Arg Lys Leu Glu Lys Glu Asn Gly Arg Lys Ile
 115 120 125
 gga uca ugc cug aua ggc gca aug ccu ggc ucu uuU uac ggc aga cuc 432
 Gly Ser Cys Leu Ile Gly Ala Met Pro Gly Ser Phe Tyr Gly Arg Leu
 130 135 140
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 145 150 155 160
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 Trp Leu Ser Gln Val Pro Ser Gly Leu Val Thr Glu Leu Gly Ile Ser
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 Ala Asn Lys Gly Cys Ile Tyr Ser Ser Lys Ala Ser Arg Pro Pro Ile
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 Gln Lys Ala Tyr Leu Asp Gln Phe Thr Lys Asp Phe Thr Thr Phe Leu
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ugg Trp 225	auu Ile	ugc Cys	aaa Lys	gaa Glu	gau Asp 230	gaa Glu	uuc Phe	gag Glu	aac Asn	ccg Pro 235	aau Asn	ucc Ser	aua Ile	gac Asp	uua Leu 240	720
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gaa Glu	aaa Lys	uug Leu	gac Asp 260	agu Ser	uuc Phe	aau Asn	guu Val	cca Pro 265	auc Ile	uau Tyr	gca Ala	ccu Pro	uca Ser 270	aca Thr	gaa Glu	816
gaa Glu	gua Val	aag Lys 275	ugc Cys	aua Ile	guu Val	gag Glu	gag Glu 280	gaa Glu	ggg Gly	ucu Ser	uuu Phe	gaa Glu 285	auu Ile	uua Leu	uac Tyr	864
cug Leu 290	gag Glu	acu Thr	uuu Phe	aag Lys	guc Val	ccu Pro 295	uau Tyr	gau Asp	gcu Ala	ggc Gly	uuc Phe 300	ucu Ser	auu Ile	gau Asp	gau Asp	912
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guc Val	gca Ala	agu Ser	cau His 340	uuu Phe	gga Gly	gaa Glu	gcu Ala	auc Ile 345	aug Met	ccu Pro	gac Asp	uua Leu	ucc Ser 350	cac His	agg Arg	1056
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23